Client's Ref.:88-13 00/12/18 Our File:0492-5089USF/HUI

WHAT IS CLAIMED IS:

25 reference potential

1 /	1.An electrostatic discharge protection circuit with high
2	trigger current, coupled to a node and a reference
3	potential for dissipating the electrostatic voltage
4	formed at said node, said electrostatic discharge
5	protection circuit comprising:
6	a substrate having a first conductivity type, coupled to
7	said reference potential;
8	a well region having a second conductivity type, formed on
9	said substrate and coupled to said node;
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10 <u>.</u> !	a first doping region having said first conductivity type,
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	electrically floated on said well region; and
12	a second doping region having said second conductivity
≡ 1 3 ≟	type, disposed on said substrate and electrically coupled
14	to said reference potential;
15=	wherein, the electrostatic discharge current of said node
16	provides a voltage with sufficient magnitude to breakdown
17	the conjunction interface between said well region and said
18	substrate, also triggering a BIPOLAR JUNCTION
19	TRANSISTOR(BJT) comprising said well region, said substrate
20	and said second doping region, for dissipating said
21	electrostatic discharge current;
22	and wherein said first doping area, when the electrostatic
23	discharge current is greater than a predetermined current,
24	reduces the potential difference between said node and said

- 2. The electrostatic discharge protection circuit as claimed
- in claim 1, wherein said electrostatic discharge protection
- 3 circuit further comprises a third doping area having said
- 4 second conductivity type, disposed in said well region,
- 5 electrically coupled to said node, for forming an ohmic
- 6 connection at said well region.
- 3. The electrostatic discharge protection circuit as claimed in claim 1, wherein said electrostatic discharge protection circuit further comprises a forth doping region having said first conductivity type, disposed at the surface of said substrate near said well region, electrically coupled to said reference potential, for forming an ohmic connection at said substrate.
- 4. The electrostatic discharge protection circuit as claimed in claim 1, wherein said first conductivity is p-type, and said second conductivity is n-type.

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- 5. The electrostatic discharge protection circuit as claimed in claim 1, wherein said electrostatic discharge circuit further comprises a fifth conductivity type having said second conductivity type, disposed at the conjunction of said well region and said substrate, for reducing the breakdown voltage at the conjunction of said well region and said substrate.
- 6. The electrostatic discharge protection circuit as claimed
- in claim 1, wherein said electrostatic discharge protection
- 3 circuit further comprises a field oxide layer, disposed at
- 4 the surface of said substrate adjacent to said fifth doping
- 5 region.

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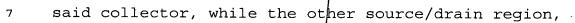
7. The electrostatic discharge protection circuit as claimed in claim 1, wherein said electrostatic discharge protection circuit further comprises a MOS resistor having a first conductivity type disposed on said substrate and comprising a gate and two source/drain regions, wherein one of said source/drain regions is electrically coupled to said well region, while the other of said source/drain regions, together with said gate, is electrically coupled to said

9 reference potential.

- 8. The electrostatic discharge protection circuit as claimed in claim 4, wherein one of said drain/source regions of said MOS resistor having said first conductivity type is comprised of said fifth doping region, and the other of said drain/source regions of said MOS resistor having said first conductivity type is comprised of said second doping region.
- 9. The electrostatic discharge protection circuit as claimed in claim 7, wherein one of said drain/source regions of said MOS resistor having said first conductivity type is comprised of said fifth doping region, and the other of said drain/source regions of said MOS resistor having said first conductivity type is comprised of said second doping region.
- 1 10. The electrostatic discharge protection circuit as
 2 claimed in claim 1, wherein said electrostatic discharge
- 3 protection circuit further comprises:
- a MOS resistor having said first conductivity type, formed
- on said substrate, comprising a gate, and two source/drain
- 6 regions, wherein one source/drain region is electrically

coupled to said well region, and the other source/drain 7 region is electrically coupled to said reference potential; 8 a resistor, its two ends electrically coupled to said gate 9 and said reference potential, respectively; and 10 11 a capacitor, its two ends electrically coupled to said gate and said node, respectively. 12 11.An electrostatic discharge protection circuit with high 2 trigger current, coupled to a node and a reference 3 potential, for dissipating the electrostatic discharge 4 current from said node, comprising: 13 ==5 a BJT, comprising an emitter, a base and a collector, wherein said emitter and said base are electrically coupled - 6 1 27 1 27 1 2 8 to said reference potential, said collector is comprised of a collector region with a second conductivity type and e^{l. l} electrically coupled to said node; and . TU fΨ 10 a first doping region having a first conductivity type, 11 floated in said collector region, and forms a conjunction 12 interface with said collector region; 13 wherein said first doping region, when said electrostatic discharge current is greater than a predetermined current, 14 reduces the potential difference between said node and said 15 16 reference potential. 12. The electrostatic discharge protection circuit as 1

claimed in claim 11, wherein said electrostatic discharge
protection circuit further comprises a MOS resistor having
a first conductivity type, disposed on said substrate,
comprising a gate, and two source/drain regions, wherein
one of said source/drain regions is electrically coupled to

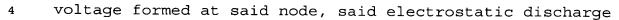


- together with said gate, is electrically coupled to said 8
- reference potential. 9

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- 13. The electrostatic discharge protection circuit as 1
- claimed in claim 11, wherein said electrostatic discharge 2
- protection circuit further comprises: 3
- a MOS resistor having said first conductivity type, 4
- comprising a gate, and $tw\phi$ source/drain regions, wherein, 5
- one source/drain regions is electrically coupled to said 6
- 7 node, and the other sour¢e/drain is electrically coupled to said reference potential;
 - a resistor, its two ends electrically coupled to said gate and said reference potential, respectively; and
 - a capacitor, its two ends electrically coupled to said gate and said node, respectively.
 - 14. The electrostatic discharge protection circuit as claimed in claim 11, wherein said first conductivity is ptype, and said second conductivity is n-type.
- 1 15. The electrostatic discharge protection circuit as
- claimed in claim 1, wherein said first conductivity is n-2
- 3 type, and said second conductivity is p-type.
- 16. The electrostatic discharge protection circuit as
- claimed in claim 10, wherein said first conductivity is n-5
- type, and said second conductivity is p-type.
- 17. An electrostatic discharge protection circuit with high
- trigger current, electrically coupled to a node and a 2
- reference potential for dissipating the electrostatic 3



- 5 protection circuit comprising:
- a base having a first conductivity type, electrically
- 7 coupled to said reference potential;
- a well region having a second conductivity type, formed on
- 9 said substrate and electrically coupled to said node;
- a first doping region having said first conductivity type,
- 11 electrically floated on said well region and electrically
- coupled to said node; and

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19 20 a second doping region having said second conductivity type, electrically floated on said base;

wherein the electrostatic discharge current of said node provides a voltage with sufficient magnitude to breakdown the conjunction interface between said well region and said base, also triggering a BJT comprising said well region, said base and said first doping region, for dissipating said electrostatic discharge current;

- 21 and wherein said second doping area, when the electrostatic
- discharge current is greater than a predetermined current,
- reduces the potential difference between said node and said
- reference potential
- 1 18. The electrostatic discharge protection circuit as
- 2 claimed in claim 17, wherein said electrostatic discharge
- 3 protection circuit further comprises a third doping area
- 4 having said second conductivity type, disposed in said well
- 5 region, electrically coupled to said node, for forming an
- 6 ohmic connection at said well region.

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19. The electrostatic discharge protection circuit as claimed in claim 17, wherein said electrostatic discharge protection circuit further comprises a forth doping region having said first conductivity type, disposed at the

surface of said base near said well region, electrically coupled to said reference potential, for forming an ohmic

7 connection at said base.

20. The electrostatic discharge protection circuit as
claimed in claim 17, wherein said electrostatic discharge
circuit further comprises a fifth conductivity type having
said second conductivity type, disposed at the conjunction
of said well region and said base, for reducing the
breakdown voltage at the conjunction of said well region
and said base.

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21. The electrostatic discharge protection circuit as claimed in claim 1, wherein said electrostatic discharge protection circuit further comprises a field oxide layer, disposed at the surface of said base adjacent to said fifth doping region.

22. The electrostatic discharge protection circuit as

claimed in claim 1, wherein said electrostatic discharge

3 protection circuit further comprises a MOS resistor having

a first conductivity type, disposed on said base,

5 comprising a gate, and two source/drain regions, wherein,

one of said source/drain regions is coupled to said well

region, while the other source drain region, together with

said gate, is coupled to said reference potential.

23. The electrostatic discharge protection circuit as

claimed in claim 20, wherein one of said drain/source

regions of said MOS resistor having said first conductivity

type is comprised of said fifth doping region, and the 4 other drain/source regions of said MOS resistor having said 5

first conductivity type is comprised of said second doping

region. 7

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24. The electrostatic discharge protection circuit as claimed in claim 22, wherein, one of said drain/source regions of said MOS resistor having said first conductivity type is comprised of said fifth doping region, and the other drain/source regions of said MOS resistor having said first conductivity type is comprised of said second doping region.

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25. The electrostatic discharge protection circuit as claimed in claim 1, wherein said electrostatic discharge protection circuit further comprises:

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a MOS resistor having said first conductivity type, formed on said base, and comprising a gate and two source/drain regions, wherein one source/drain region is coupled to said well region, and the other source/drain region is coupled to said reference potential;

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a resistor, its two ends coupled to said gate and said 9 reference potential, respectively; and 10

a capacitor, its two ends coupled to said gate and said 11 12 node, respectively.

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26. The electrostatic discharge protection circuit as

claimed in claim 17, wherein said electrostatic discharge 2

circuit further comprises a sixth conductivity type having 3

said first conductivity type, disposed at the conjunction 4

of said well region and said base, for reducing the 5

- breakdown voltage at the conjunction of said well region and said base.
- 1 27. The electrostatic discharge protection circuit as
- claimed in claim 26, wherein said electrostatic discharge
- protection circuit further comprises a field oxide layer,
- 4 disposed at the surface of said well adjacent to said sixth
- 5 doping region.

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28. The electrostatic discharge protection circuit as claimed in claim 27, wherein said electrostatic discharge protection circuit further comprises a MOS resistor having a second conductivity type, disposed on said well region, comprising a gate and two source/drain regions, wherein one of said source/drain regions is electrically coupled to said base, while the other source/drain region, together with said gate, is electrically coupled to said node.

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29. The electrostatic discharge protection circuit as claimed in claim 18, wherein, one of said drain/source of said MOS resistor having said second conductivity type is comprised of said sixth doping region, and the other drain/source of said MOS resistor is comprised of said third doping region.

6 third doping region.

- 1 30. The electrostatic discharge protection circuit as
- claimed in claim 28, wherein, one of said drain/source of
- said MOS resistor having said second conductivity type is
- 4 comprised of said sixth $d\phi$ ping region, and the other
- drain/source of said MOS resistor is comprised of said
- 6 third doping region.
- 1 31. The electrostatic discharge protection circuit as
- claimed in claim 26, wherein said electrostatic discharge
- 3 protection circuit further comprises:

- a MOS resistor having said second conductivity type,
- 5 comprising a gate, and two source/drain regions, wherein,
- one source/drain region is electrically coupled to said
- node, and the other sourde/drain region is electrically
- 8 coupled to said reference potential;
- a resistor, its two ends electrically coupled to said gate
- and said node, respectively; and

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- a capacitor, its two ends electrically coupled to said gate
- and said reference voltage, respectively.
 - 32. The electrostatic discharge protection circuit as claimed in claim 17, wherein said first conductivity is ptype, and said second conductivity is n-type.
 - 33. The electrostatic discharge protection circuit as claimed in claim 17, wherein said first conductivity is n-type, and said second conductivity is p-type.
 - 34. An electrostatic discharge protection circuit with high trigger current, electrically coupled to a node and a reference potential for dissipating the electrostatic
- 4 voltage formed at said node, said electrostatic discharge
- 5 protection circuit\comprising:
- a BJT, comprising ah emitter, a base and a collector,
- wherein said emitter and said base are electrically coupled
- s to said node, said collector is comprised of a collector
- 9 region with a first conductivity type and electrically
- 10 coupled to said reference potential; and
- a second doping region having a second conductivity type,
- 12 floated in said collector region, and forms a conjunction
- interface with said collector region;

- wherein said second doping region, when said electrostatic 14
- discharge current is greater than a predetermined current, 15
- reduces the potential difference between said node and said 16
- reference potential. 17
- 35. The electrostatic discharge protection circuit as 1
- claimed in claim 34, wherein said electrostatic discharge 2
- protection circuit further comprises a MOS resistor having 3
- 4 a first conductivity type, comprising a gate, and two
- 5 source/drain, wherein, one of said source/drain is
- electrically coupled to \$aid collector, while the other 6
- source/drain region, together with said gate are 7
- electrically coupled to \$aid reference potential.
 - 36. The electrostatic discharge protection circuit as claimed in claim 34, wherein said electrostatic discharge protection circuit further comprises:
- a MOS resistor having said first conductivity type, 4 comprising a gate, and two source/drain, wherein, one source/drain is electrically coupled to said node, and the other source/drain is electrically coupled to said reference potential;
- a resistor, its two ends are respectively electrically 9
- 10 coupled to said gate and said reference potential; and
- a capacitor, its two ends are respectively electrically 11
- coupled to said gate and said node. 12
- 37. The electrostatic discharge protection circuit as 1
- claimed in claim 11, wherein said first conductivity is p-2
- type, and said second conductivity is n-type. 3